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Flexible Format, Computer Accessed Telemetry System

The problem:

To automate simple decisions relating to sampling, multiplexing, coding, and storage of data in digital form.

The solution:

A concept for a flight telemetry system which is based on a nested DO-loop computer procedure to sample data sensors at any desired frequency and with random access.

How it's done:

Ordinarily, data management involves a more-or-less fixed sampling sequence derived from a clock-controlled commutator, but the system to be described, called Computer Accessed Telemetry System (CATS), permits programmed sequencing of the commutator. With the new system, it is possible to sample and generate two or more simultaneous formats at once so that one format can be transmitted to a ground station in real time, and the other is used on board or is stored for later transmission. A distinct advantage of the CATS is that the data from any randomly accessed sensor can be further processed on board in accordance with compression, activity-monitoring, and computer-altering algorithms and basic sensor decisions before transmission. The CATS approach also enables a central computer and sequencer to diagnose spacecraft problems that require correlating the outputs of a number of sensors to reach a decision.

In the implementation of CATS, sensor output comparison data, plus information to control the format, the compression algorithm, and allowable degree of sensor activity, are stored in a memory.

This information, for one sensor at a time, in any sequence, is loaded into input/output/control registers where it interacts with the control circuitry and with new data in the multialgorithm compressor; significant changes are read back into the memory and then transferred to storage. The storage buffers also remove gaps due to compression and equalization; buffer groups are assigned different priorities for readout to telemetry in the proper sequence. The interface with the central computer and sequencer permits use of sophisticated programs to analyze and correct data anomalies by format changes or changes in algorithm.

The hardware design for CATS is based upon highly-reliable redundant-element techniques which include: 1) a tree-switch commutator to provide minimum redundancy with highest reliability, 2) redundant modular construction and roll-back program structure to avoid error propagation, as developed for a special computer, 3) memory organization that minimizes error propagation.

The organization of CATS and its reliability features make it attractive for use as a general-purpose data-handling system.

Notes:

1. The tree-switch commutator is described in Tech Brief B73-10289.
2. Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP 73-10290

(continued overleaf)

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,665,417). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

NASA Patent Counsel
Mail Code 1
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Richard A. Easton
and Edward E. Hilbert of
Caltech/JPL
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